

**Oscillatory instability development in extraction system
of a negative ion source**

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Ion source based on a volume ion production as a rule is characterized by the presence of the working gas in the extraction system leaking from the gas-discharge chamber. Depending on the residual gas pressure the quasineutral or plasma regimes of the beam propagation are realized. In both regimes the development of the different plasma-beam instabilities may occur. In the paper presented the development of the oscillatory instability is discussed which takes place under some conditions in the three-component plasma system. This instability is caused by the secondary (plasma) electrons inside the beam volume. The quantity of the electrons may be rather small – about 0.01 percents of the density of the beam. Analytically the range of the stable beam propagation is determined. The case of one-dimensional system is considered that corresponds to the diode with the large aspect ratio. The instability increment is shown to be rather small. Maximum increment of the oscillations corresponds to the thermal particle velocities, and one can say about resonance character of the instability. The group velocity of the oscillations is near the beam particle velocity so the oscillations are the “drift” oscillations. The instability is studied numerically too with the help of COMSOL Multiphysics.